AAR-100

Human Factors Newsletter # 03-02

January 25, 2003 – February 7, 2003

Project Report: *Linking Flight Operational Quality Assurance (FOQA) and the Advanced Qualification Program (AQP) – Analyzing Simulator and Flight Data to Improve Pilot Training*
The Advanced Analysis Method for FOQA and Simulator Data Project is a research and development effort whose primary goal is to devise practical systems, methods and techniques for air carriers in the use of digital flight data recorded during line operations. The Flight Crew Training Management and Support emphasis area of this project seeks to develop the tools and techniques to allow FAA Flight Standards and air carrier training organizations to make use of digital flight data. Work in this emphasis area has been underway for five years, and has been closely linked to the Aviation Performance Measurement System (APMS) APMS project. When the entire project is complete, it is envisioned that the project would use this expanded environment, functioning as a component of APMS.

The primary task of the project is the analysis of flight data from line operations to assess the aggregate proficiency of the flight crew population, and to determine which operational tasks and task components should receive more or less emphasis in continuing qualification training. For these analyses, detailed formal standards of proficiency for flight crew operations are required. These standards are most clearly established at carriers who have completed the development of an Advanced Qualification Program (AQP). Accordingly, a major objective of the Flight Crew Training Management and Support emphasis area is the identification of flight data parameter profiles that predict levels of proficiency in AQP Qualification Standards.

The approach taken to establish these relationships is to gather flight data during simulator operations, and determine the statistical correlation between grades given to trainee performance and variations in various flight data parameters. Once these relationships are established in the form of predictor models, they can serve as a starting point for researchers to study the relative level of proficiency with which these same qualification standards are performed during line operations. During this analysis, it has become clear that only a part of the variance in instructor grades can be predicted by correlations with the flight performance parameters, so it has become increasingly important to analyze instructor grading patterns and to look for other contributors to the variance (such as Crew Resource Management - CRM, etc.).

In FY 2002, researchers continued collecting simulator data At the end of the year, the database reached 4285 hours of simulator session data in which 792 parameters were sampled every second. This is over 24 gigabytes of data at this point. The instructor grades given for the AQP related events in these simulator sessions constitute a database of 186,822 grades. This valuable archive is being used by other FAA researchers for study of cockpit automation, as well.

During the year, four predictor models were refined by the statistical team, one each for V1 Cut, RTO, Normal Takeoff and Landing. These models, originally built in a progression of approaches (including logistic regression), were updated to newer recursive partitioning techniques.

As these models have matured, it has become clear that there are limits imposed on their eventual power by all instructor grading patterns, the limited variance imposed by the performance of experienced crews in recurring training, the restricted grading scale in use, and the influence of factors not reflected in the performance of the aircraft as revealed by the parameter data. Among the most obvious of these factors are CRM and procedural components of crew performance that do not result in a predictable change in aircraft performance (parameter data). The project has attacked these problems on several fronts.

The project is actively supporting the inter-rater reliability (IRR) and instructor training programs for the MD80 instructors, and providing and helping with the use of the IETC IRR analysis software. As part of this effort, the project has actively promoted and demonstrated alternative data representations for training (such as data animation). There is interest on the part of the MD80 AQP program in transitioning from a once-- year IRR calibration exercise to continuing calibration, with recalibration at least monthly, through use of a new set of IRR problems to be distributed to the instructors every month. These problems would be provided by the project initially, until the AQP group is trained to do its own. Each problem would be a set of AQP events to be graded, and would be presented as an animated 3-D aircraft performing the events over terrain, coordinated with a completely animated set of cockpit instruments.

Using this same capability, the project conducted a study in which 14 instructors graded 32 data animations of landings for which grades had been given in the simulator. Of a total of 23 animation sessions for which there was agreement among instructor/evaluators (IE), 14 animation grades were lower than the simulator grade, three animation grades were higher than the simulator grade, and six animation grades agreed with the simulator grade. The most reasonable explanation for this is that under the difficult circumstances often set up in the simulator by the instructors, somewhat uneven performance in the technical performance of the maneuvers is mitigated in grading if the instructor sees that the crew is aware of their performance and is actively working together to make the necessary adjustments. In the data animation, this mitigating information is not available, and the instructors grade only on the strict parameters of the technical performance.

A follow-on study for FY 2003 using scripted events, including cockpit audio and video, will extend and refine this study and specifically investigate this hypothesis. If it is supported, it would suggest that there are definite limits to how powerful the predictor models will be, and the focus for providing feedback from FOQA into AQP should be at the finer level of granularity of

individual AQP performance standards, rather than the larger scale of complex AQP events. (E. Edens, AFS-230)

Air Carrier Team Training: Human factors researchers were participants on a Medical Teams Training Expert Panel convened by the Department of Health and Human Services' Agency for Health Care Research and Quality. The meeting was held on Monday, January 27th in Washington, D.C. Attendees included Dr. Eduardo Salas, Dr. Florian Jentch, Dr. David Baker, Dr. Clint Bowers, Dr. Robert Helmreich and Dr. Jeff Beaubien, all of whom are researchers on FAA-funded grants. The research group gathered with 23 medical professionals to discuss appropriate course content and methods to evaluate team training in military medical settings. The course concepts are based on Crew Resource Management training that has been in air carrier pilot training since the late 80's. (E. Edens, AFS-230)

NEXCOM: The second Next Generation Communication (NEXCOM II) human factors simulation began on January 26th and continued through February 7th. In this simulation, airline pilots flew four 1-hour scenarios in the Reconfigurable Cockpit Simulator (B747) and the General Aviation Trainer (C421) in generic airspace. A controller from Indianapolis Center and 11 Technical Center simulation pilots provided air traffic control and additional aircraft in the scenarios from the Research, Development, and Human Factors Laboratory. The objective of the study is to compare communications system performance and pilot workload and acceptance of the Very High Frequency Digital Link Mode 3 (VDL3) radio with the current analog radios. The NAS Human Factors Group (ACB-220), the R&D Labs Group (ACB-840), and the Simulation Group (ACB-860) are collaborating to conduct the simulation, which is sponsored by the Air/Ground Communications Product Team (AND-360). The first NEXCOM simulation indicated that VDL3 could be implemented without any negative effects on air traffic controllers. (E. Stein, WJHTC)

Human Factors Tools on the Web: The Human Factors Research and Engineering Division (AAR-100) Web site has recently been updated with additions to the System Acquisition "Tools" section. These tools can be accessed at "http://www.hf.faa.gov/tools.htm" and include the following:

- Guidelines for Human Factors Requirements Development. This is a brief guide to preparing human factors requirements in support of Integrated Requirements Teams. The guide includes a list of human factors issue areas from the FAA Human Factors Job Aid, and modified by the FAA Inter-Agency IPT, a list of suggested Critical Operational Issues (COIs) and Additional Critical Operations Issues (ACOIs). It also includes a template for tailoring human factors input to initial requirements documents (IRDs) and final requirements documents (FRDs). (Glen Hewitt, AAR-100, & Rebecca Gray, Titan Systems, Inc.)

- Guidelines for Human Factors Assessments in Investment Analysis. This document provides the definition and process for addressing estimates of human factors costs, risks, and benefits in support of FAA Investment Analysis as conducted by ASD-400. The guide includes a recently revised heuristic for estimating human factors costs based on the project/program's requirements, complexity, pace, safety considerations, etc. Also included are guides to estimating the probability and severity of adverse events related to human factors risks. (Glen

Hewitt, AAR-100)

- Human Factors Design Standard. A link to the William J. Hughes Technical Center provides access to the recently revised chapters of the Human Factors Design Standard (HFDS). The HFDS supersedes the Human Factors Design Guide published in 1996, and is soon to be distributed on CD. (Vicki Ahlstrom, ACB-220)

More information on human factors research can be found at the FAA Human Factors (AAR-100) web site: http://www.hf.faa.gov

Mark D. Rodgers
FAA (AAR-100)

CALENDAR

February 9 – 11, 2003 - Heli-Expo 2003, Dallas, Texas. Contact: www.rotor.com

February 11 – 16, 2003 - Australian International Air Show, Melbourne, Australia. Contact: www.pacific2002.net.au

February 25-26, 2003 – FAA Research, Engineering and Development Advisory Committee, Subcommittee on Human Factors Meeting, FAA Headquarters, Room 932 mailto:gloria.dunderman@faa.gov

March 3-6, 2003 – SAE 2003 World Congress, Cobo Center, Detroit, MI http://www/sae.org/congress/index.htm

March 5-6, 2003 – ASPA/ICAO Seminar on Cross-Cultural Issues in Aviation Safety, Mexico City, Mexico mailto:dmaurino@icao.int

March 18-19, 2003 - 28th FAA Commercial Aviation Forecast Conference at the Renaissance Washington DC Hotel, Washington, DC. For more information, visit Event Website

March 17-19, 2003 – 15th Annual European Aviation Safety Seminar presented by the Flight Safety Foundation and European Regions Airlines Association, Hotel Intercontinental Geneve, Geneva, Switzerland http://www.flightsafety.org/seminars.html

March 24-28, 2003 – SAE Airplane Safety Assessment Committee, Lisbon, Portugal mailto:lemon@sae.org

April 2-8, 2003 – Sun 'n Fun EAA Fly In, Lakeland, FL http://www.sun-n-fun.org

April 5-10, 2003 –CHI 2003 Conference on Human Factors in Computing Systems, Broward Convention Center, Ft. Lauderdale, FL http://www.chi2003.org/

April 7-27, 2003 – Aviation World's Fair, Newport News/Williamsburg, VA http://www.worlds-fair.com/ or http://aviation-worlds-fair.com/

April 9-11, 2003 – SAE Aircraft Environmental Systems Committee, Dayton, OH mailto:elizd@sae.org

April 22-23, 2003 – 48th Annual Corporate Aviation Safety Seminar, presented by the Flight Safety Foundation and the National Business Aviation Association, Westin Diplomat Resort and Spa, Hollywood, FL http://www.flightsafety.org/seminars.html

April 27-30, 2003 – Symposium on Interactive 3D Graphics, Monterey Marriott, Monterey, CA mailto:Pausch@cmu.edu

April 29-30, 2003 - FAA Research, Engineering and Development Advisory Committee (REDAC) Meeting, FAA Headquarters, Bessie Coleman Room gloria.dunderman@faa.gov

May 3-10, 2003 – International Conference on Software Engineering, Hilton Portland, Portland, OR mailto:ldillon@cse.msu.edu

May 4-9, 2003 – 74th Annual Scientific Meeting of the Aerospace Medical Association, Convention Center, San Antonio, TX http://www.asma.org/

May 6 – 8, 2003 - AHS International 59th Annual Forum and Technology Display, Phoenix Civic Plaza, Phoenix, AZ. General Information - Call for Papers - Exhibitors

May 12-15, 2003 – DOD TAG-49, Country Suites Augusta Riverwalk, Augusta, GA http://hfetag.dtic.mil/meetschl.html

May 12-17, 2003 - 2003 IEEE International Conference on Robotics and Automation, The Grand Hotel, Taipei, Taiwan http://www.icra2003.org/

June, 2003 – SAE Digital Human Modeling for Design and Engineering, Location TDB http://www/sae.org/calendar/aeromtgs.htm

June 2-3, 2003 - The National Center of Excellence for Aviation Operations Research (NEXTOR) Conference on Air Traffic Management and Control, hosted by NEXTOR - Virginia Tech, Virginia Tech Graduate Center, Falls Church, VA

June 15-22, 2003 – 45th Paris Air Show le bourget http://www.paris-air-show.com/index3.htm

June 18-19, 2003 – 6th GAIN World Conference, Alitalia Auditorium, Rome, Italy
http://www.gainweb.org/whatsnew.html

June 22-27, 2003 – 10th International Conference on Human-Computer Interaction, Institute of Computer Science Foundation, Research and Technology, Science and Technology Park of Crete, Heraklion, Crete, Greece mailto:info@hcii2003.gr

June 23-25, 2003 – Human Systems Integration Symposium "Enhancing Human Performance in Naval and Joint Environments", Sheraton Premier Hotel, Tyson's Corner, VA http://www.navalengineers.org/Events/HSIS2003/HSIS.html

July 7-10, 2003 – SAE 33rd International Conference on Environmental Systems, The Westin Bayshore Resort and Marina, Vancouver, Canada http://www/sae.org/calendar/aeromtgs.htm

July 14-17, 2003 – AIAA/ICAS International Air & Space Symposium and Exposition, Dayton Convention Center, Dayton, OH http://www.flight100.org/

July 21 – 23, 2003 - 4th Australian Pacific Vertiflite Conference on Helicopter Technology, Melbourne, Victoria, Australia. Contacts: Dr. Arvind K. Sinha and Mr. Raden Kusumo

July 29-August 4, 2003 – 51st Annual AirVenture, Oshkosh, WI http://airventure.org/

August 7-10, 2003 – 111th Convention of the American Psychological Association, Toronto, Ontario, Canada http://www.apa.org/convention

September 9-11, 2003 – SAE Aerospace Congress and Exhibition, Palais des Congrès, Montreal, Quebec, Canada http://www/sae.org/calendar/aeromtgs.htm

September 15-17, 2003 – FAA/TCA/CAA Safety Management in Aviation Maintenance Symposium, Toronto, Canada

September 16-18, 2003 - 1st International Congress on Health and Safety in Transportation. Paris, France http://www.biomedicale.univ-paris5.fr/LAA/eindex.htm

September 16 – 18, 2003 - 29th European Rotorcraft Forum, Friedrichshafen, Germany. Contact B. Gmelin at bernd.gmelin@dir.de

September 18-19, 2003 – National Academy of Engineering 2003 Frontiers of Engineering Symposium, Irvine, CA *Welcome to the National Academy of Engineering (NAE)*

October 6 – 9, 2003 - NATO Research and Technology Agency, Applied Vehicle Technology Panel (AVT) will present "The Vehicle Propulsion Integration Symposium" in Poland. For more information contact cheynes@rta.nato.int

October 7 – 9, 2003 - National Business Aviation Association Annual Meeting & Convention, Orlando, Florida. Contact: www.nbaa.org

October 13-17, 2003 – Human Factors and Ergonomics Society 47th Annual Meeting, Adams Mark Denver Hotel, Denver, CO http://www.hfes.org/

October 27-28, 2003 – National Academies Institute of Medicine Annual Meeting, National Academy of Sciences, Washington, DC *http://wwwsearch.nationalacademies.org/*

November, 2003(tentative) – DOD TAG-50, Fall 2003, Phoenix, AZ *http://hfetag.dtic.mil/meetschl.html*

January 11-15, 2004 – Transportation Research Board Annual Meeting, Washington, DC http://www4.trb.org/trb/annual.nsf

January 21 – 23, 2004 - AHS 4th Decennial Specialists' Meeting on Aeromechanics, Fisherman's Wharf, San Francisco, CA. For more information contact the Technical Chairman, Tom Maier at tmaier@mail.acr.nasa.gov

April, 2004 – SAE General Aviation Technology Conference and Exhibition, Century II Convention Center, Wichita*, KS* http://www/sae.org/calendar/aeromtgs.htm

May 6-8, 2004 - AHS International 60th Annual Forum and Technology Display, Virginia Beach, VA. Contact Staff@vtol.org

July 27-August 2, 2004 – 52nd Annual AirVenture, Oshkosh, WI http://airventure.org/

May 2-7, 2004 – 75th Annual Scientific Meeting of the Aerospace Medical Association, Egan Convention Center, Anchorage, AK http://www.asma.org/

July 28 – August 1, 2004 – 112th Convention of the American Psychological Association. Honolulu, Hawaii http://www.apa.org/convention

September 20-24, 2004 – Human Factors and Ergonomics Society 48th Annual Meeting, Sheraton New Orleans Hotel, New Orleans, LA http://www.hfes.org/

October 18-19, 2004 – National Academies Institute of Medicine Annual Meeting, National Academy of Sciences, Washington, DC *http://wwwsearch.nationalacademies.org/*

October 24-25, 2005 – National Academies Institute of Medicine Annual Meeting, National Academy of Sciences, Washington*, DC http://wwwsearch.nationalacademies.org/*

Note: Calendar events in Italics are new since the last Newsletter

Comments or questions regarding this newsletter?
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